



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Gopel B. Avinash

Serial No.: 09/682,934

Group Art Unit: 2621

Filed: November 1, 2001

Examiner: Patel, Shefali D.

For: METHOD FOR CONTRAST MATCHING OF MULTIPLE IMAGES OF  
THE SAME OBJECT OR SCENE TO A COMMON REFERENCE  
IMAGE

Attorney Docket No.: 120768 (GEMS 0135 PUS)

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APPEAL BRIEF

Mail Stop Appeal Brief-Patents  
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Dear Sir:

The following Appeal Brief is submitted pursuant to the Notice of Appeal filed December 28, 2005 and the Notice of Panel Decision from Pre-Appeal Brief Review of February 21, 2006, which states to proceed to the Board of Patent Appeals and Interferences, in the above-identified application.

03/23/2006 RFEKADU1 00000032 09682934

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**I. Real Party in Interest**

The real party in interest in this matter is GE Medical Systems Global Technology Company, LLC in Waukesha, Wisconsin (hereinafter "GE"), which is the assignee of the present invention and application.

**II. Related Appeals and Interferences**

There are no other known appeals or interferences, which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**III. Status of the Claims**

Claims 1-3, 5-12, and 14-20 of the present application are currently pending. Claims 4 and 13 have been canceled. Claims 1-3, 5-12, and 14-20 stand under final rejection, from which this appeal is taken. A copy of the claims on appeal is attached as an Appendix.

**IV. Status of Amendments**

Claims 1, 5, 10, 14, and 18 were amended in response to the Non-Final Office Action of December 13, 2004. In the Response of July 19, 2005, in the Response of November 28, 2005, and in the Pre-Appeal Brief Request for Review of December 28, 2005 remarks were provided for the allowance of all currently pending claims. No amendments were filed subsequent to the July 19<sup>th</sup> Response. The Applicant believes for the reasons previously provided and for the reasons provided herein that the claims as provided in the July 19<sup>th</sup> Response are independently patentable and allowable.

**V. Summary of Claimed Subject Matter**

By way of summary, the present invention is directed to a method of contrast matching images, to a method of operating a digital image device, and to an imaging system as recited in independent claims 1, 10, and 18, respectively. Independent claims 1, 10, and 18 encompass several points of novelty, and since claims 2-3, 5-9, 11-12, 14-17, and

19-20 depend from claims 1, 10, and 18, respectively, they also contain at least the same points of novelty.

The contrast matching method of claim 1 includes the limitation of generating an image ratio of a first image A1 and a second image A2. The ratio has a numerator and a denominator. The image ratio is regularized by adding a constant to the denominator to form a regularized image ratio. See paragraphs [0018]-[0020], [0022], and [0024] and Figure 2 of the present application. The regularized image ratio is filtered to form a filtered ratio. The second image A2 is multiplied by the filtered ratio to form an adjusted image A1<sub>MK</sub>. See paragraphs [0019]-[0022] and Figure 2 of the present application.

The operating method of claim 10 includes generating a first digital image A1 and a second digital image A2. The second image A2 is matched to the first image A1 by generating an image ratio of the first image A1 and the second image A2. The ratio has a numerator and a denominator. An image ratio of the second image A2 with respect to the first image A1 is regularized to form a regularized image ratio. See paragraphs [0018]-[0020], [0022], and [0024] and Figure 2 of the present application. The regularized image ratio is filtered to form a filtered ratio. The second image A2 is multiplied by the filtered ratio to form an adjusted image A1<sub>MK</sub>. See paragraphs [0019]-[0022] and Figure 2 of the present application.

The imaging system 10 of claim 18 includes an image forming device that generates a first image A1 and a second image A2. A controller 28 is coupled to the image forming device and receives the first image A1 and the second image A2. The controller 28 generates an image ratio of the first image A1 and the second image A2. The ratio has a numerator and a denominator. The controller 28 also regularizes an image ratio of the second image A2 with respect to the first image A1 to form a regularized image ratio by adding a constant to the denominator of that ratio. See paragraphs [0018]-[0020], [0022], and [0024] and Figure 2 of the present application. The regularized image ratio is filtered by the controller 28 to form a filtered ratio. The controller 28 multiplies the second image A2 by the filtered ratio to form an adjusted image A1<sub>MK</sub>. See paragraphs [0019]-[0022] and Figure 2 of the present application.

The methods of claims 1 and 10 and the system of claim 18 in generating and regularizing the stated ratios to form an adjusted image, reduce the subjective nature associated with viewing images with different contrast and brightness portions. The methods and system minimizes the subjective normalization commonly associated with comparing images. The methods and systems provide efficient techniques with consistent results that provide smooth resultant images without artificial contrast or bright regions. Variability in brightness and contrast between the images is reduced. The methods and system, by regularizing the generated ratio, account for poor quality and noisy images. As a result, the resultant images can be displayed with the same contrast and brightness, thereby providing an objective comparison.

Applicant agrees that the prior art within the field of medical imaging has included determining a mean ratio of integrated bright image values of sub-image signals. It is also admitted that the prior art has included determining a ratio between frequency magnitudes of fundamental receive signals centered at a fundamental frequency and harmonic signals centered at a harmonic frequency, which are associated with backscattered received signals from tissue and contrast agent within a region. It is further admitted that the prior art discloses a regularized ratio through the adding of a non-zero constant to a denominator of a ratio. What is not known or suggested are the several novel aspects of the present invention. All of the novel aspects of the present invention are not taught or suggested by the prior art separately or in combination. The novel aspects are described in detail below.

With respect to independent claims 1, 10, and 18 what is not known or suggested is the generation of an image ratio of a first image and a second image. What is also not known or suggested is the regularization of the stated image ratio. What is further not known or suggested is the filtering of that regularization. Further yet, the multiplying of that regularization by the second image to form an adjusted image is not known or suggested. In addition, image contrast matching is not known or suggested. Additional novel aspects of the claimed invention are recited in the below summary of claims 2-3, 5-9, 11-12, 14-17, and 19-20 and in the Argument Section below.

Claim 2 recites a method according to claim 1 wherein filtering includes low pass filtering. See paragraphs [0019]-[0022] and Figure 2 of the present application.

Claim 3 recites a method according to claim 2 wherein low pass filtering includes boxcar filtering. See paragraph [0021] of the present application.

Claim 5 recites a method according to claim 1 wherein regularizing includes multiplying the numerator by the second image A2 and the denominator by the second image A2 and adding the constant to the denominator. See paragraphs [0022] and [0024] of the present application.

Claim 6 recites a method according to claim 1 wherein multiplying includes multiplying the second image A2 by the filtered ratio to form the adjusted image where the adjusted image A1<sub>MK</sub> is contrast matched to the first image A1. See paragraphs [0018]-[0022] and [0025] of the present application.

Claim 7 recites a method according to claim 1 wherein multiplying includes multiplying the second image A2 by the filtered ratio to form the adjusted image A1<sub>MK</sub> where the adjusted image A1<sub>MK</sub> is brightness matched to the first image A1. See paragraphs [0018]-[0022] and [0025] of the present application.

Claim 8 recites a method according to claim 1 wherein multiplying includes multiplying the second image A2 by the filtered ratio to form the adjusted image A1<sub>MK</sub> where the adjusted image A1<sub>MK</sub> is contrast and brightness matched to the first image A1. See paragraphs [0018]-[0022] and [0025] of the present application.

Claim 9 recites a method according to claim 1 further including prior to filtering, regularizing an image ratio of the second image A2 with respect to the first image A1 to form a regularized image ratio.

Claim 11 recites a method according to claim 10 wherein filtering includes low pass filtering. See paragraphs [0019]-[0022] and Figure 2 of the present application.

Claim 12 recites a method according to claim 11 wherein low pass filtering includes boxcar filtering. See paragraph [0021] of the present application.

Claim 14 recites a method according to claim 10 wherein regularizing includes multiplying the numerator by the second image A2 and the denominator by the second

image and adding the constant to the denominator. See paragraphs [0022] and [0024] of the present application.

Claim 15 recites a method according to claim 10 wherein multiplying includes multiplying the second image A2 by the filtered ratio to form the adjusted image A1<sub>MK</sub> where the adjusted image A1<sub>MK</sub> is contrast matched to the first image A1. See paragraphs [0018]-[0022] and [0025] of the present application.

Claim 16 recites a method according to claim 10 wherein multiplying includes multiplying the second image A2 by the filtered ratio to form the adjusted image A1<sub>MK</sub> where the adjusted image A1<sub>MK</sub> is brightness matched to the first image A1. See paragraphs [0018]-[0022] and [0025] of the present application.

Claim 17 recites a method according to claim 10 wherein multiplying includes multiplying the second image A2 by the filtered ratio to form the adjusted image A1<sub>MK</sub> where the adjusted image A1<sub>MK</sub> is contrast and brightness matched to the first image A1. See paragraphs [0018]-[0022] and [0025] of the present application.

Claim 19 recites a system according to claim 18 further including a display 30 coupled to the controller 28 for displaying the adjusted image A1<sub>MK</sub>. See paragraphs [0013]-[0014] and Figure 1 of the present application.

Claim 20 recites a system according to claim 18 further including a storage medium 32 for storing the first image A1 the second image A2 and the adjusted image A1<sub>MK</sub>. See paragraphs [0013]-[0014] and Figure 1 of the present application.

## **VI. Grounds of Rejection to be Reviewed on Appeal**

The following issues are presented in this appeal, which correspond directly to the Examiner's final grounds for rejection in the Final Office Action of September 30, 2005, hereinafter referred to as the "Final Office Action", and in the Advisory Action of December 12, 2005, hereinafter referred to as the "Advisory Action":

- (1) whether claims 1-2, 5, 7, 9-11, 14, 16, and 18-20 are patentable under 35 U.S.C. 103(a) over Bruijns et al. (U.S. Pat. No. 5,974,113) in view of Bolorforosh et al. (U.S. Pat. No. 6,132,377); and

- (2) whether claims 3, 6, 8, 12, 15, and 17 are patentable under 35 U.S.C. 103(a) over Bruijns in view of Bolorforosh, as applied to claims 1-2, 5, 7, 9-11, 14, 16, and 18-20, and further in view of Poland (U.S. Pat. No. 6,080,107).

## VII. Argument

### A. THE REJECTION OF CLAIMS 1-2, 5, 7, 9-11, 14, 16, and 18-20 UNDER 35 U.S.C. § 103(a)

Claims 1-2, 5, 7, 9-11, 14, 16, and 18-20 stand fully rejected under 35 U.S.C. §103(a) over Bruijns in view of Bolorforosh.

Bruijns discloses a technique for composing an image from multiple sub-image signals  $S_1$ ,  $S_2$ . The sub-image signals  $S_1$ ,  $S_2$  are associated with different portions of an optical image formed. This is further described in col. 6, lines 15-34 of Bruijns, in which it is stated that a first sub-image signal  $S_1$  refers to alternating pixel or image lines with respect to a second sub-image signal  $S_2$ . In other words, each of the sub-image signals  $S_1$ ,  $S_2$  is not a complete image or an image, but rather is a signal that has information associated with a predetermined portion of an entire image. The technique of Bruijns includes determining upper mean values for each of the sub-image signals  $S_1$ ,  $S_2$ . The upper mean values refer to the mean brightness values for each of the sub-image signals  $S_1$ ,  $S_2$  or the integrated brightness values of each of the sub-image signal  $S_1$ ,  $S_2$ . The upper mean values are used to calculate a ratio. A gain correction term  $\Delta G$  and an offset correction term  $\delta$  are determined as a function of the ratio. The gain correction term  $\Delta G$  and the offset correction term  $\delta$  are applied to the second sub-image signal  $S_2$  prior to be combined with the first sub-image signal  $S_1$  to form the composite image.

Bolorforosh discloses an ultrasonic imaging system 10 that insonifies a tissue and a contrast agent therein with transmitted signals  $T$ . The imaging system 10 receives a tissue signal  $R_T$  and a contrast agent signal  $R_C$ . The tissue signal  $R_T$  and the contrast signal  $R_C$  have frequency magnitude peaks at a fundamental frequency  $f$  and a harmonic frequency  $2f$ . Bolorforosh states that the frequency magnitude peaks at the fundamental frequency  $f$

for the received signals  $R_T$  and  $R_C$  are approximately the same, whereas the frequency magnitude peaks at  $2f$  are different. The differences at the  $2f$  frequency are more prevalent when small amounts of contrast agent are used. The system of Bolorforosh, based on this knowledge, allows one to adjust an image to be more specific to tissue information or contrast agent information by modulating the received signals  $R_T$  and  $R_C$  with a gain signal. The gain signal  $G$  is formed through the formation of a ratio  $R$  of the frequency magnitude values at the fundamental frequency  $f$  with respect to the frequency magnitude values at the harmonic frequency  $2f$ . The frequency magnitude values at  $f$  and at  $2f$  are each associated with both the received signals  $R_T$  and  $R_C$ . An image signal is formed as a function of the fundamental signals, the harmonic signals, and the gain signal. An image is generated in response to the image signal.

With respect to claims 1, 10, and 18, the Final Office Action states that Bruijns discloses generating a ratio of a first image and a second image. Applicant submits that Bruijns generates a mean ratio of integrated brightness image part values associated with the sub-image signals  $S_1$  and  $S_2$ . Bruijns does not generate a ratio of a first image and a second image. The ratio of Bruijns is determined prior to the generation of an image. Mean brightness values of bright portions of the sub-image signals  $S_1$  and  $S_2$  are determined. From the mean values a composite image is generated. As such, Bruijns generates a ratio of two mean values. On the other hand, the claimed methods and system recite the generation of a ratio of a first image and a second image. The ratio of a first image and a second image refers to the ratio of the many individual pixel values of the first image to the pixel values of the second image.

The ratio of Bruijns is not the division of a first sub-image with a second sub-image, but rather is the division of a first upper mean value of a first sub-image signal with a second upper mean value of a second sub-image signal. A "mean" value refers to a mathematical average, *see Merriam-Webster's Third New International Dictionary*, or in the case of Bruijns the average of the brightness values of a sub-image signal. The determination of such an average is not recited in any of the claims. In the prosecution history and in the specification of the present invention the ratio of a first image and a



second image refers to the division of each of the corresponding pixels between each of the images. This is clearly not shown or suggested in Bruijns. Applicant understands that the limitations ought not to be read into the claims from the specification. However, in review of the application and the definitions of the term "image" one skilled in the art would clearly understand that the claimed limitation of generating a ratio of a first image and a second image means as above-stated. Besides the claims and thus the claim terms ought to be construed in view of and in a consistent manner with the specification.

The Final Office Action states, which is reiterated in the Advisory Action, that Bolorforosh discloses the generation of a ratio of a first image and a second image, and refers to the ratio of the fundamental signals (received signals  $R_T$  and  $R_C$  at frequency  $f$ ) and the harmonic signals (received signals  $R_T$  and  $R_C$  at frequency  $2f$ ). As stated above, although the fundamental signals and the harmonic signals of the received signals  $R_T$  and  $R_C$  are used to generate an image, the ratio generated is not of images, but rather is of frequency magnitude peaks for two different frequencies. More specifically, the ratio  $R$  of Bolorforosh is the ratio of the signal magnitude at the fundamental frequency  $f$  relative to the signal magnitude at the harmonic frequency  $2f$  for each of the combined received signals  $R_T$  and  $R_C$ . The ratio is not between the received signals  $R_T$  and  $R_C$ , but rather is between the frequency magnitudes at  $f$  and  $2f$  for the combined received signals  $R_T$  and  $R_C$ .

The system of Bolorforosh, based on the ratio  $R$ , generates a gain signal, which is applied to the fundamental signals and the harmonic signals, which are used to generate an image signal. For a single image there is a corresponding fundamental signal and corresponding harmonic signal, which are used to generate that image. Thus, the ratio  $R$  is not of images, but rather is a value or set of values associated with magnitudes at two different frequencies.

Regardless of whether the fundamental signals and the harmonic signals are image signals, the ratio  $R$  is clearly not a ratio of images or image signals. In close review of the system of Bolorforosh, including the operation of the filters 21 and 22, the detectors 28 and 30, the integrators 32 and 34, and the subtractor/divider 36 contained therein, one skilled in the art can readily determine that the ratio  $R$  is a ratio of power spectral density signal

magnitude values for two different frequencies and is not a ratio of magnitude values for pixels of different images.

In addition, Applicant submits that when extrinsic reference sources evidence more than one definition for a term, the intrinsic record must be consulted to identify which of the different possible definitions is most consistent with Applicant's use of the terms. See *Brookhill-Wilk I*, 334 F.3d at 1300, 67 USPQ2d at 1137 (Fed. Cir. 2003). Intrinsic evidence includes the claims, the specification, and the prosecution history. Extrinsic evidence includes dictionaries. Extrinsic evidence is turned to only when the intrinsic evidence is insufficient to establish the clear meaning of the asserted claim. *Zodiac Pool Care Inc. v. Hoffinger Indus. Inc.*, 206 F. 3d 1408, 1414, 54 USPQ2d 1141, 1145 (Fed. Cir. 2000) and *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582-84, 39 USPQ2d 1573, 1576-78 (Fed. Cir. 1996). Thus, the intrinsic record includes, not just the application, but also the intended interpretations and other related descriptions provided by the Applicant in the prosecution history.

The prosecution history is often most probative of claim term meaning. Appellant submits that the Board should consider the application's prosecution history in determining the meaning and scope of claim terms. The history contains the complete record of all of the proceedings before the Patent and Trademark Office, including any express representations made by the Appellant regarding the scope of the claims. As such, the record before the Patent and Trademark Office is often of critical significance in determining the clearest meaning of the claims. See *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 980, 34 USPQ2d 1321, 1330 (Fed. Cir. 1995).

The Applicant submits that in interpreting the term "image", especially in association with the claimed terms "a ration of a first image and a second image", the Applicant clearly did not intend such term to refer to that disclosed in Bruijns and Bolorforosh. Specifically, the stated term was not intended to mean separated associated portions of an image, a selected set of alternating lines or bands of an image, or frequency magnitudes that are used to form an image. It was not intended that an image refer to a single mean value or a single or set of values used to generate a gain signal. Applicant

does not understand how such a comparison can be made. A mean ratio value refers to a single value whereas an image refers to a physical likeness or representation of an object and has many associated pixel values. A frequency magnitude ratio for an instance in time also refers to a single value, from which an image cannot be formed.

Applicant has expressly submitted herein and have suggested throughout the prosecution history the provided definition of the term "image". Thus, to suggest a broad reasonable interpretation of the term "image" to be a mean brightness ratio value or a frequency magnitude ratio value would be inconsistent with the prosecution history and the present application as a whole. Such an interpretation is simply unreasonable and improper.

In addition, claims terms ought to be construed in view of the intrinsic evidence, which is the primary source of claim interpretation. See *Phillips v. AWH Corp.* No. 03-1269, 75 USPQ2d 1321 (Fed. Cir. 2005). The intrinsic record clearly provides for the intended meaning of the claim term. Therefore, one cannot deem the definition of the term "image" other than as the Applicant has unequivocally pronounced.

Since the stated references fail to teach or suggest the formation of a ratio as that claimed, they also fail to teach or suggest the use of such a ratio and the performance of any tasks use that ratio. Thus, the stated references also fail to teach or suggest the limitations of regularizing the claimed ratio, filtering the regularized image ratio, and the multiplying of a second image by the filtered ratio to form an adjusted image. Although Bolorforosh discloses the use of a regularized ratio, the regularized ratio pertains to the magnitude relationship between to different frequencies as opposed to an image ratio, as claimed.

Also, with respect to claim 1, neither of the references discloses contrast matching of images. Bruijns discloses determining the upper mean values for brightness values of sub-image signals. As stated in the Pre-Appeal Brief Request for Review, those skilled in the imaging art would recognize that brightness and contrast are very different parameters. "Brightness" refers to the location of a visual perception along a continuum from black to white or the level of illumination. "Contrast" refers to degree of tonal separation or

gradation in the range from black to white or the amount of difference between the lightest and darkest areas of an image. See *Merriam-Webster's Third New International Dictionary*. In Bruijns brightness is adjusted for a second sub-image relative to a first sub-image, not contrast. Bolorforosh fails to disclose brightness or contrast matching.

Also, referring to MPEP 706.02(j) and 2143, to establish a *prima facie* case of obviousness the prior art reference(s) must teach or suggest all the claim limitations. *In Re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). Thus, Applicant submits that Bruijns and Bolorforosh, alone or in combination, fail to teach or suggest each and every limitation of claims 1, 10, and 18, therefore the combinations in claim 1, 10, and 18 are not found in the prior art and each of the stated claims are believed to be independently patentable and allowable for the above-stated reasons.

Claim 2 is believed to be independently patentable and allowable for the reasons set forth above since it depends from claim 1. Claim 2 is further believed to be independently patentable and allowable since it further recites that wherein filtering includes low pass filtering. In addition, the filtering of Bruijns is the filtering of the mean brightness ratio not of an image ratio as claimed. Bolorforosh does not disclose a low pass filter or the use thereof.

Claim 5 is believed to be independently patentable and allowable for the reasons set forth above since it depends from claim 1. Claim 5 is further believed to be independently patentable and allowable since it further recites that wherein regularizing includes multiplying the numerator by the second image and the denominator by the second image A2 and adding the constant to the denominator. Bruijns as admitted in the Final Office Action does not disclose the regularizing of an image ratio. Bolorforosh discloses the regularizing of a frequency magnitude ratio, not an image ratio.

Claim 7 is believed to be independently patentable and allowable for the reasons set forth above since it depends from claim 1. Claim 7 is further believed to be independently patentable and allowable since it further recites that wherein multiplying includes multiplying the second image A2 by the filtered ratio to form the adjusted image A1<sub>MK</sub>

where the adjusted image  $A1_{MK}$  is brightness matched to the first image  $A1$ . See also above arguments.

Claim 9 is believed to be independently patentable and allowable for the reasons set forth above since it depends from claim 1. Claim 9 is further believed to be independently patentable and allowable since it further recites prior to filtering, regularizing an image ratio of the second image  $A2$  with respect to the first image  $A1$  to form a regularized image ratio. See also above arguments.

Claim 11 is believed to be independently patentable and allowable for the reasons set forth above since it depends from claim 10. Claim 11 is further believed to be independently patentable and allowable since it further recites that wherein filtering includes low pass filtering. See also above arguments.

Claim 14 is believed to be independently patentable and allowable for the reasons set forth above since it depends from claim 10. Claim 14 is further believed to be independently patentable and allowable since it further recites that wherein regularizing includes multiplying the numerator by the second image  $A2$  and the denominator by the second image  $A2$  and adding the constant to the denominator. See also above arguments.

Claim 16 is believed to be independently patentable and allowable for the reasons set forth above since it depends from claim 10. Claim 16 is further believed to be independently patentable and allowable since it further recites that wherein multiplying includes multiplying the second image  $A2$  by the filtered ratio to form the adjusted image  $A1_{MK}$  where the adjusted image  $A1_{MK}$  is brightness matched to the first image. See also above arguments.

Claim 19 is believed to be independently patentable and allowable for the reasons set forth above since it depends from claim 18. Claim 19 is further believed to be independently patentable and allowable since it further recites a display 30 coupled to the controller 28 for displaying the adjusted image  $A1_{MK}$ . See also above arguments.

Claim 20 is believed to be independently patentable and allowable for the reasons set forth above since it depends from claim 18. Claim 20 is further believed to be independently patentable and allowable since it further recites a storage medium 32 for

storing the first image A1 the second image A2 and the adjusted image A1<sub>MK</sub>. See also above arguments.

**B. THE REJECTION OF CLAIMS 3, 6, 8, 12, 15, and 17 UNDER 35 U.S.C. § 103(a)**

Claims 3, 6, 8, 12, 15, and 17 stand fully rejected under 35 U.S.C. 103(a) over Bruijns in view of Bolorforosh, as applied to claims 1-2, 5, 7, 9-11, 14, 16, and 18-20, and further in view of Poland.

Claim 3 is believed to be independently patentable and allowable for the reasons set forth above since it depends from claim 2. Claim 3 is further believed to be independently patentable and allowable since it further recites that low pass filtering includes boxcar filtering. See also above arguments.

Claim 6 is believed to be independently patentable and allowable for the reasons set forth above since it depends from claim 1. Claim 6 is further believed to be independently patentable and allowable since it further recites that wherein multiplying includes multiplying the second image A2 by the filtered ratio to form the adjusted image A1<sub>MK</sub> where the adjusted image A1<sub>MK</sub> is contrast matched to the first image A1. As stated above, both Bruijns and Bolorforosh fail to teach or suggest contrast matching. It is admitted in the Final Office Action that Bruijns fails to teach or suggest the contrast matching claimed. The Final Office Action, however, states that Poland discloses in col. 11, lines 58-65 and col. 12, lines 21-34 such matching. Applicant submits that in the stated sections, Poland discloses the controlling of a scan rate of a sequence to provide a desired effect on the concentration of contrast agent in a region of interest. Contrast agent refers to the agent introduced into the bloodstream or region of interest. By adjusting the scanning rate, one is better able to see areas having the contrast agent. Poland also discloses determining the relative concentration levels of a contrast agent, which may be used to adjust system parameters such as transmit power, transmit frequency, or scan rate. The monitoring or comparing of concentration levels of a contrast agent is unrelated to the contrast of an image and the contrast matching of images. The concentration of a contrast agent corresponds to the level of contrast agent within a region, which affects the ability to view

that region or decipher that region from another region. See above for the definition of “contrast” with respect to an image. Besides, concentration levels of contrast agent for different images are not matched in Poland, but rather are simply compared to adjust the stated parameters.

Claim 8 is believed to be independently patentable and allowable for the reasons set forth above since it depends from claim 1. Claim 8 is further believed to be independently patentable and allowable since it further recites that wherein multiplying includes multiplying the second image A2 by the filtered ratio to form the adjusted image A1<sub>MK</sub> where the adjusted image A1<sub>MK</sub> is contrast and brightness matched to the first image A1. See also above arguments.

Claim 12 is believed to be independently patentable and allowable for the reasons set forth above since it depends from claim 11. Claim 12 is further believed to be independently patentable and allowable since it further recites that wherein low pass filtering includes boxcar filtering. See also above arguments.

Claim 15 is believed to be independently patentable and allowable for the reasons set forth above since it depends from claim 10. Claim 15 is further believed to be independently patentable and allowable since it further recites that wherein multiplying includes multiplying the second image A2 by the filtered ratio to form the adjusted image A1<sub>MK</sub> where the adjusted image A1<sub>MK</sub> is contrast matched to the first image A1. See also above arguments.

Claim 17 is believed to be independently patentable and allowable for the reasons set forth above since it depends from claim 10. Claim 17 is further believed to be independently patentable and allowable since it further recites that wherein multiplying includes multiplying the second image A2 by the filtered ratio to form the adjusted image A1<sub>MK</sub> where the adjusted image A1<sub>MK</sub> is contrast and brightness matched to the first image A1. See also above arguments.

**VIII. Appendix**

A copy of the claims involved in this appeal, namely claims 1-3, 5-12, and 14-20 is attached hereto as Appendix A. An evidence Appendix B and a related proceedings Appendix C are also provided.

**IX. Conclusion**

For the reasons advanced above, the Appellant respectfully contends that each claim is patentable. Therefore reversal of the rejection is requested.

Respectfully submitted,

ARTZ & ARTZ, P.C.

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## APPENDIX A

What is claimed is:

1. A method of contrast matching a first image and a second image comprising:  
generating an image ratio of the first image and the second image, said ratio having a numerator and a denominator;  
regularizing the image ratio by adding a constant to the denominator to form a regularized image ratio;  
filtering the regularized image ratio to form a filtered ratio; and  
multiplying the second image by the filtered ratio to form an adjusted image.
2. A method as recited in claim 1 wherein filtering comprises low pass filtering.
3. A method as recited in claim 2 wherein low pass filtering comprises boxcar filtering.
5. A method as recited in claim 1 wherein regularizing comprises multiplying the numerator by the second image and the denominator by the second image and adding the constant to the denominator.
6. A method as recited in claim 1 wherein multiplying comprises multiplying the second image by the filtered ratio to form the adjusted image where the adjusted image is contrast matched to the first image.
7. A method as recited in claim 1 wherein multiplying comprises multiplying the second image by the filtered ratio to form the adjusted image where the adjusted image is brightness matched to the first image.

8. A method as recited in claim 1 wherein multiplying comprises multiplying the second image by the filtered ratio to form the adjusted image where the adjusted image is contrast and brightness matched to the first image.

9. A method as recited in claim 1 further comprising prior to filtering, regularizing an image ratio of the second image with respect to the first image to form a regularized image ratio.

10. A method of operating a digital image device comprising:  
generating a first digital image;  
generating a second digital image;  
matching the second image to the first image by,  
generating an image ratio of the first image and the second image, said ratio having a numerator and a denominator;  
regularizing an image ratio of the second image with respect to the first image to form a regularized image ratio;  
filtering the regularized image ratio to form a filtered ratio; and  
multiplying the second image by the filtered ratio to form an adjusted image.

11. A method as recited in claim 10 wherein filtering comprises low pass filtering.

12. A method as recited in claim 11 wherein low pass filtering comprises boxcar filtering.

14. A method as recited in claim 10 wherein regularizing comprises multiplying the numerator by the second image and the denominator by the second image and adding the constant to the denominator.

15. A method as recited in claim 10 wherein multiplying comprises multiplying the second image by the filtered ratio to form the adjusted image where the adjusted image is contrast matched to the first image.

16. A method as recited in claim 10 wherein multiplying comprises multiplying the second image by the filtered ratio to form the adjusted image where the adjusted image is brightness matched to the first image.

17. A method as recited in claim 10 wherein multiplying comprises multiplying the second image by the filtered ratio to form the adjusted image where the adjusted image is contrast and brightness matched to the first image.

18. An imaging system comprising:  
an image forming device for generating a first image and a second image; and  
a controller coupled to said image forming device for receiving said first image and said second image; said controller generating an image ratio of the first image and the second image, said ratio having a numerator and a denominator regularizing an image ratio of the second image with respect to the first image to form a regularized image ratio by adding a constant to the denominator, filtering the regularized image ratio to form a filtered ratio, and multiplying the second image by the filtered ratio to form an adjusted image.

19. An imaging system as recited in claim 18 further comprising a display coupled to said controller for displaying said adjusted image.

20. An imaging system as recited in claim 18 further comprising a storage medium for storing the first image the second image and the adjusted image.

**APPENDIX B**

No submitted or entered evidence.

## APPENDIX C

No related proceedings.



PTO/SB/17 (12-04)

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Effective on 12/08/2004.

Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).

**FEE TRANSMITTAL**  
**For FY 2005**☐ Applicant claims small entity status. See 37 CFR 1.27**TOTAL AMOUNT OF PAYMENT** (\$) 500.00**Complete if Known**

Application Number	09/682,934
Filing Date	November 1, 2001
First Named Inventor	Gopel B. Avinash
Examiner Name	Shelfali D. Patel
Art Unit	2621
Attorney Docket No.	120768 (GEMS 0135 PUS)

**METHOD OF PAYMENT** (check all that apply)☐ Check ☐ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): \_\_\_\_\_☒ Deposit Account Deposit Account Number: 07-0845 Deposit Account Name: GTC

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☒ Charge fee(s) indicated below☐ Charge fee(s) indicated below, except for the filing fee☒ Charge any additional fee(s) or underpayments of fee(s)  
under 37 CFR 1.16 and 1.17☒ Credit any overpayments**WARNING:** Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.**FEE CALCULATION****1. BASIC FILING, SEARCH, AND EXAMINATION FEES**

Application Type	FILING FEES		SEARCH FEES		EXAMINATION FEES		Fees Paid (\$)
	Fee (\$)	Small Entity Fee (\$)	Fee (\$)	Small Entity Fee (\$)	Fee (\$)	Small Entity Fee (\$)	
Utility	300	150	500	250	200	100	
Design	200	100	100	50	130	65	
Plant	200	100	300	150	160	80	
Reissue	300	150	500	250	600	300	
Provisional	200	100	0	0	0	0	

**2. EXCESS CLAIM FEES**

Fee Description	Small Entity Fee (\$)	Fee (\$)
Each claim over 20 or, for Reissues, each claim over 20 and more than in the original patent	50	25
Each independent claim over 3 or, for Reissues, each independent claim more than in the original patent	200	100
Multiple dependent claims	360	180

Total Claims	Extra Claims	Fee (\$)	Fee Paid (\$)
- 20 or HP = _____ x _____ = _____			

HP = highest number of total claims paid for, if greater than 20

Indep. Claims	Extra Claims	Fee (\$)	Fee Paid (\$)
- 3 or HP = _____ x _____ = _____			

HP = highest number of independent claims paid for, if greater than 3

**3. APPLICATION SIZE FEE**

If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$250 (\$125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof	Fee (\$)	Fee Paid (\$)
- 100 = _____ / 50 = _____ (round up to a whole number) x _____ = _____				

**4. OTHER FEE(S)**

Non-English Specification, \$130 fee (no small entity discount)

Other: Appeal Brief

Fees Paid (\$)
500.00

**SUBMITTED BY**

Signature	<i>Jeffrey D. Chapp</i>	Registration No. 50,579 (Attorney/Agent)	Telephone 248-223-9500
Name (Print/Type)	Jeffrey D. Chapp	Date March 20, 2006	

This collection of information is required by 37 CFR 1.136. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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